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Examiner: T.T. Snyder
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Substitute Specification

[0001] HAND-HELD VACUUM CLEANER INCLUDING A BUILT-IN HOSE
AND AN ADJUSTABLE WIDTH NOZZLE

[0002] BACKGROUND

[0003] Field of the Invention

[0004] The present invention is related to a hand-held vacuum cleaner, and more particularly to one provided with adjustable nozzle width and a retractable hose hidden in a dust receiver that automatically extends during use.

[0005] Description of the Prior Art:

[0006] Hand-held vacuum cleaners generally available in the market have a fixed nozzle that prevents adjustment of its width; therefore, specific external accessories including flexible hoses, wider nozzles or nozzles having different shapes are required to extend the hose and/or change the width of the nozzle. When not used, those external accessories must be separately stored and retrieved for assembly when the hand-held vacuum cleaner is needed. While time is wasted on the assembly, those external accessories are also vulnerable to loss or damage. Therefore, the separate design of the external accessories is not very handy for the use of the hand-held vacuum cleaner.

[0007] SUMMARY

[0008] The primary purpose of the present disclosure is to provide a hand-held vacuum cleaner integrated with an adjustable nozzle width and a retractable hose. Another purpose is to provide a hand-held vacuum cleaner integrated with a nozzle having adjustable width. To achieve this purpose, one side or both sides of the principle nozzle are provided with one expandable nozzle or two expandable nozzles. Each expandable nozzle is comprised of a slider and one or more than one connectors. When

the slider retreats to engage to the connector, the vacuum cleaner operates with its original nozzle width; when required, both of the slider and the connector can expand outward to allow a wider nozzle for a larger vacuum area providing for time saving, easier operation and a significant increase of improved efficiency to make sure that built-in accessories will not get lost and to eliminate the need for separate storage of external accessories.

[0009] Another purpose is to provide a hand-held vacuum cleaner with adjustable nozzle width. To achieve this purpose, the slider may be adapted to lock to one or more than one connectors by means of matching hooks to ensure that the slider and the connector will not separate from each other when the slider is expanded.

[0010] Another purpose is to provide a hand-held vacuum cleaner with a retractable hose. To achieve this purpose, an inner sleeve is provided in the dust receiver of the vacuum cleaner, and the primary nozzle is adapted with a built-in hose. The hose is flexible so as to be compressed to be stored in the inner sleeve. The flexible hose will be ejected out of the sleeve for a doubled length if required to facilitate cleaning where the area to be cleaned prevents direct access, such as a drawer, slit or groove.

[0011] BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is an exploded view of a first embodiment of a hand-held vacuum cleaner.

[0013] Fig. 2 is a sectional view of an assembly of the first embodiment.

[0014] Fig. 3 is a sectional view showing a nozzle in its narrow status of the first embodiment.

[0015] Fig. 4 is a sectional view of a dust receiver of the first

embodiment.

[0016] Fig. 5 is a perspective view of an expanded nozzle of the first embodiment.

[0017] Fig. 6 is a sectional view of an assembly of the expanded nozzle of the first embodiment.

[0018] Fig. 7 is a perspective view of the appearance of the expanded nozzle of the first embodiment.

[0019] Fig. 8 is a perspective view of the appearance of the narrow nozzle of the first embodiment.

[0020] Fig. 9 is a sectional view of a release key of the first embodiment.

[0021] Fig. 10 is a bottom view of the release key of the first embodiment.

[0022] Fig. 11 is a bird's eye view of a local part of the first embodiment.

[0023] Fig. 12 is a sectional view showing that the release key of the first embodiment is mounted to a holder.

[0024] Fig. 13 is a cross-sectional view of a local part showing the interaction by means of matching hooks between a slider and a connector of the first embodiment.

[0025] Fig. 14 is a schematic view showing that the release key and the slider of the first embodiment are hooked to each other.

[0026] Fig. 15 is a sectional view showing that the release key and the slider of the first embodiment are hooked to each other in a locked position.

[0027] Fig. 16 is a sectional view showing that the hook of the slider is compressed by the release key of the first embodiment in order to release the slider.

[0028] Fig. 17 is a sectional view showing the primary members of the dust receiver of the first embodiment.

[0029] Fig. 18 is a schematic view showing that the primary nozzle of the first embodiment is released but not yet closed up.

[0030] Fig. 19 is a schematic view showing that the primary nozzle of the first embodiment is released and closed up.

[0031] DETAILED DESCRIPTION

[0032] Referring to Figs. 1, 2 and 3, an embodiment of a hand-held vacuum cleaner is essentially comprised of a cleaner 1, a primary nozzle 2 and one set or two sets of expandable nozzles 3, 3a. Wherein, the cleaner 1 like the prior art includes a dust receiver 11, a strainer 12, a fan 13, a motor 14, a power switch 15, a handle 16, and a battery set 17. In an embodiment of the present hand-held vacuum cleaner, an opening 18 is formed at the front end of the dust receiver 11 of the cleaner 1 to accommodate the combination of the primary nozzle 2 and both expandable nozzles 3, 3a. Multiple retainers 181 (181a) and 182 (182a) are each respectively provided on both sides of the inner wall and the bottom of the opening 18. A holder 111 is provided to the dust receiver 11 at the top of the opening 18. As illustrated in Fig. 4, a through hole 112 is provided on both sides of the holder 111, retainers 113 are provided on both side walls of the holder 111, as shown in Figs. 15 and 16, and a through hole 114 is provided at the lower end of the holder 111.

[0033] The primary nozzle 2 includes a member with narrow nozzle having its terminal end connected to a flexible hose 21 and a positioning nub or stop 22 is provided on the wall at the top of the nozzle.

[0034] Sets of the expandable nozzles 3, 3a are provided on both sides, or one set of the expandable nozzle 3 is provided on a selected side of the

primary nozzle 2. Each expandable nozzle 3, (3a) is comprised of a slider 31 (31a) and a connector 32 (32a) engaged to each other by sliding. A coil 33 (33a) is provided to each set of the expandable nozzle 3, (3a) placed between where the slider 31 (31 a) and the connector 32 (32a) are moveably inserted in the opening 18 of the dust receiver 11. Both of the slider 31 (31 a) and the connector 32 (32a) are either expanded away from each other as illustrated in Figs. 5, 6 and 7 when the coil 33 (33a) is released, or retreated into each other as illustrated in Fig. 3 or Fig. 8 when the coil 33 (33a) is compressed.

[0035] The holder 111 provided on the upper wall at the front end of the dust receiver 11 contains a release key 19 as illustrated in Figs. 9, 10 and 11. A hook 191 is provided on both outer walls of the release key 19. A first plunger 192 is provided at a selected location to push and release the expandable nozzle 3 (3a), and a second plunger 193 is provided to push and release the primary nozzle 2. A return coil 194 as illustrated in Fig. 12 is placed within the release key 19 for a fast return of the release key 19 after the key has been compressed. Furthermore, as reinforcement to the structural strength of the first plunger 192, an additional rib 195 is connected to the first plunger 192 between the first plunger 192 and the inner wall of the release key 19.

[0036] The expandable nozzle 3 (3a) is comprised of the slider 31 (31a) and the connector 32 (32a) by means of two matching hooks to allow both the slider 31 (31a) and the connector 32 (32a) to retreat into each other, thus to make sure that they will not disengage from each other. As illustrated in Figs. 13 and 14, two matching hook bits 311 (311a) and 321 (321a) respectively extending from the slider 31 (31a) and the connector 32 (32a) constitute relative retainers for both the slider 31 (31a) and the connector 32 (32a) while another end of the hook bit 321 (321a) provided to the connector 32

(32a) s held by the retainer 181 (181a) from the inner wall of the opening 18 as illustrated in Fig. 6. Accordingly, when the expandable nozzle 3 (3a) is stretched out, it functions as a limiting retainer as illustrated in Figs. 6 and 7 to prevent the slider 31 (31a) and the connector 32 (32a) from disengaging from each other. On the other hand, when the opening returns to a narrow nozzle, the hook bit 311 (311a) is used to block a sidewall 23 of the primary nozzle 2, as shown in Fig. 8, so that the primary nozzle 2 may not be extended.

[0037] As illustrated in Figs. 1 and 5, the slider 31 (31a) and the connector 32 (32a) are each respectively provided with the hook bit 312 (312a) and a matching groove 322 (322a) for the hook bit 312 (312a) to slide in the groove 322 (322a) and to function as a retainer between the slider 31 (31a) and the connector 32 (32a) when the hook bit 312 (312a) slides to the extreme in the groove 322 (322a).

[0038] A recess 313 (313a) is provided at the bottom of the slider 31 (31a) to define a retaining stop together with the retainer 182 (182a) provided on the bottom wall in the opening 18.

[0039] As illustrated in Fig. 15, the hook bit 312 (312a) provided to the slider 31 (31a) provides a positioning and locking mechanism by engaging with the retainers 113 provided on both sidewalls of the holder 111. The first plunger 192 of the release key is configured to engage with the hook bit 312 (312a). Accordingly, once the release key 19 is compressed as illustrated in Fig. 16, the first plunger 192 pushes against the hook bit 312 (312a) of the slider 31 (31a) to release the connector 32 (32a) via the biasing force from the coil 33 (33a) to widen the expandable nozzle 3 (3a).

[0040] An inner sleeve 183 is extended from the inner wall of the opening 18 of the dust receiver as illustrated in Fig. 17 to accommodate the built-in flexible hose 21 connected to the primary nozzle 2. A limiting ring

211 is inserted into the terminal end of the flexible hose 21, a gradation 184 is provided at the front end of the wall of the inner sleeve 183, and a retainer ring 185 is locked to the terminal end of the wall of the inner sleeve 183, so that the limiting ring 211 may respectively engage with the gradation 184 or the retainer ring 185 to prevent the flexible hose 21 from falling out of the inner sleeve 183 when the flexible hose 21 advances from or retracts into the inner sleeve 183.

[0041] The positioning nub or stop 22 provided on the wall at the top of the primary nozzle 2 is inserted into the through hole 114 provided at the lower end of the holder 111 and is held in position therein when the flexible hose 21 is compressed to be stored inside the inner sleeve 183. The built-in flexible hose 21 is further secured inside the inner sleeve 183 by the hook bit 311 (311a), which in the normal condition blocks the sidewall 23 of the primary nozzle 2, as previously discussed, and as shown in Fig. 8.

[0042] The expandable nozzle 3 (3a) has a coil 33 (33a) placed between the slider 31 (31a) and the connector 32 (32a). One end of the coil 33 (33a) is fixed to hold against an inner rod 115 or elsewhere as selected inside the dust receiver 11. The coil further penetrates through the connector 32 (32a) so that the other end of the coil 33 (33a) may be held or fixed against the slider 31 (31a), as shown in Fig. 6. Accordingly, once the release key 19 is compressed, the slider 31 (31a) is ejected to pull the connector 32 (32a) outwardly to widen the extendable nozzle 3 (3a).

[0043] The primary nozzle is released by the engagement between the second plunger 192 and the positioning nub or stop 22 before the expandable nozzle 3 (3a) has fully expanded. However, the sidewall 23 of the primary nozzle 2 is still blocked by the hook bit 311 (311 a), as previously described and as shown in Fig. 8. Therefore, the release key 10 has to first go through a compression to widen the expandable nozzle 3 (3a) so as to be free from being blocked by the hook bit

311 (311a), as shown in Fig. 7. Then after a second time of compressing the release key so the second plunger 193 of the release key 19 may push against the positioning nub or stop 22 of the primary nozzle 2, the primary nozzle 2 is finally automatically ejected together with the flexible hose 21. Meanwhile the expandable nozzle 3 (3a) retreats to its original status to such extent allowing only the primary nozzle 2 and its built-in flexible hose 21 to be ejected for vacuum cleaning as illustrated in Fig. 19. Furthermore, the built-in flexible hose 21 is easily compressed and hidden inside the inner sleeve 183. Once the flexible hose 21 is ejected, it extends to a longer hose to facilitate cleaning areas where the hand-held vacuum cleaner is prevented direct access, such as a drawer, slit or groove.

[0044] Within the scope of the teaching of the present disclosure, the design of the structure allowing the width of the nozzle to be adjustable may be applied to a hand-held vacuum cleaner, without the additional structure of the extendable and retractable nozzle and hose. Likewise, the improvement involving the storage of the built-in flexible hose that can be doubled in length as taught in the present disclosure can be individually applied to a hand-held vacuum cleaner, without the additional structure of the expandable nozzle. Both the expandable nozzle and the built-in hose are integrated into the present embodiment at the same time.

[0045] It is sufficient for members of the present embodiment including the slider 31 (31a), the connector 32 (32a) and the coil 33 (33a.) of the expandable nozzle 3 (3a) to be provided means of retractable sliding relative to one another. The connection structure of each matching hook bit certainly is not limited to the embodiment as illustrated. Any other replacement or substitute with equivalent function may be used. Furthermore, it is not necessary to provide an expandable nozzle 3 (3a) on

both sides of the primary nozzle 2. Instead, a single expandable nozzle 3 or 3a may be provided on either side of the primary nozzle 2 to achieve the same purpose of widening ~~up~~ the nozzle.

[0046] Similarly, multiple connectors 32 (32a) may be connected in series by the same or equivalent hook bit for the slider 31 (31a) to push all at once, or each in turn, those multiple connectors 32 (32a) to outwardly expand to define a multi-sectional combination of the expandable nozzle 3 (3a), thus to further widen the nozzle. Therefore, the embodiment given in the present disclosure is not to limit the technical scope of the present invention. Any other equivalent replacement and/or substitute components or features should fall within the teaching of the present invention.

[0047] The present invention, by providing a hand-held vacuum cleaner with its nozzle width adjustable and a built-in flexible hose, is innovative, advanced and practical.